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Research Article

**FORMULATION AND EVALUATION OF A HERBAL
SHAMPOO****Gouri Kumar Dash* and Noor Husna Nazirah Binti A. Razak**Faculty of Pharmacy and Health Sciences, Universiti Kuala Lumpur Royal College of
Medicine Perak, 30450 Ipoh, Malaysia**Abstract:**

The study was aimed at formulating and evaluating a complete herbal shampoo containing only traditionally used plant materials. The shampoo contained extracts of Hibiscus rosa-sinensis, Azadirachta indica, Trigonella foenum-graecum, Phyllanthus emblica, Sapindus mukorossi, Acacia concinna and fresh juice of Aloe vera. The physicochemical parameters such as colour, clarity, pH, skin irritation, percentage of solid contents, dirt dispersion, foaming ability and foam stability, wetting time and conditioning performance were studied using recommended procedures. The shampoo revealed ideal characteristics of a shampoo with excellent conditioning performance. The shampoo was devoid of any harmful chemicals and can be used as an alternative to its synthetic counterpart.

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INTRODUCTION:

Shampoos are hair care products used to clean the hair and scalp. These are typically available in the form of a viscous liquid, but sometimes although less common, are available in the form of powders. They are applied to the wet hair, well massaged and finally rinsed out. The ultimate goal of a shampoo is to remove the unwanted debris that is build up in the hair and or with antimicrobial properties that will prevent infection on the scalp, without stripping out much of sebum and make hair unmanageable.

Many synthetic shampoos commercially available contain one or more either of the following ingredients: ammonium lauryl sulphate, sodium lauryl sulfate, diethanolamine, dimethicone, formaldehyde, lanolin, parabens, petroleum, polyethylene glycol, propylene glycol, triethanolamine etc. which are reported to be harmful and may cause serious adverse effects upon long term use [1].

Herbal shampoos have evolved as an alternative to synthetic shampoos since they are considered safe and the ingredients used in such shampoos have been used traditionally for many years around the world. There are several medicinal plants that are reported to possess beneficial effects on hair and are used in formulation of shampoo in their powdered form or extracts or derivative form [2]. The primary advantage of using natural shampoo is to maintain healthy hair without worrying the side effects of chemicals contained in synthetic shampoos [3]. But, surprisingly many other shampoos available in the commercial market, labeled as 'herbal' or 'natural' are also found to contain one or more of the above synthetic ingredients along with some herbal extracts or natural products in order to expand their commercial value. Consumers always believe that a good shampoo offers rich lather and therefore the manufacturers include a good amount of synthetic detergents or surfactants in to such shampoos, but their regular use often leads to several complications such as dryness of hair, hair loss, irritation to scalp and eyes [4]. Inclusion of other undesirable synthetic chemicals also may result in to serious side effects [5].

In the light of the above and considering the importance of natural products, the present work was aimed at formulating and evaluating a shampoo containing only traditionally used plant materials. The ingredients included the extracts of the leaves of *Hibiscus rosa-sinensis* L. (Malvaceae), leaves of *Azadirachta indica* A. Juss. (Meliaceae), seeds of *Trigonella foenum-graecum* L. (Fabaceae), fruits of *Phyllanthus emblica* L. (Phyllanthaceae), pericarp of *Sapindus mukorossi* Gaertn. (Sapindaceae) and pods of *Acacia concinna* (Willd.) DC (Mimosaceae) and

fresh juice of *Aloe vera* (L.) Burm.f. (Asphodelaceae).

The leaves and flowers of *H. rosa-sinensis* are used as stimulant to enhance hair grow and maintain the hair colour [6]. The leaves of *A. indica* is used for its antiseptic and antimicrobial properties to treat dandruff, itchy and dry scalp. Hair loss due to excessive production of sebum that clog the pores of the scalp also can be treated using *A. indica* [7]. *T. foenum-graecum* is a good source of lecithin which is a natural emollient helps to strengthen and moisturize hair and keeps the dandruff and lice away [8]. Further, these plant materials serve as good antimicrobial agents. *P. emblica* reduces hair loss and graying, and nourish hair [9]. *S. mukorossi* and *A. concinna* are rich with saponins and used as natural surfactant. Saponins also possess insecticidal properties and therefore traditionally used for removing lice from the scalp [10]. This study was designed to formulate a herbal shampoo containing all the above ingredients assuming that the product will support all basic requirements for a shampoo.

MATERIALS AND METHODS:

The plant specimens of *H. rosa-sinensis*, *A. vera* and *A. indica* were collected from the gardens of Taman Herba, Perak and authenticated by the botanists. Seeds of *T. foenum-graecum*, Pericarp of *S. mukorossi* and pods of *A. concinna* were collected from local markets while fruits of *P. emblica* were obtained from Taman Herba Negeri Melaka. The collected plant materials except *A. vera* were thoroughly washed to clean adhering debris, shade dried and pulverised to get coarse powder. Fresh gels of *A. vera* were collected from the fresh leaves during preparation of the formulation. Herbarium specimens were preserved at Universiti Kuala Lumpur Royal College of Medicine (UniKL RCMP) Perak for future reference.

Extraction

Dried pericarp of *S. mukorossi* (55g), pods of *A. concinna* (150 g) and leaves of *A. indica* (200 g) were separately defatted with petroleum ether and extracted with ethanol - water (7:3) by maceration for 72 h. The extraction of the seeds of *T. foenum-graecum* (115 g), leaves of *H. rosa-sinensis* (100 g) and fruits of *P. emblica* (350 g) were performed separately by boiling with distilled water under reflux for 45 min. Following extraction, the liquid extracts were concentrated under reduced pressure which yielded dried residues of the extracts. The dried extracts were then stored in a refrigerator until further use.

Formulation of Shampoo

Formulation of herbal shampoo (Fig. 1) was prepared by using different proportions of the ingredients

(Table 1). The ingredients were well triturated in a mortar using pestle and blended until an ideal homogenous dispersion was achieved. The mixture was then stirred well with slow stirring on a magnetic stirrer and there was no sediment remained at the bottom. A small amount of sucrose was heated in a porcelain crucible to get caramel which served as the colouring agent for the shampoo. pH of the shampoo was adjusted between 5 and 7 with small amount of sodium hydroxide solution.



Fig. 1: Formulated herbal shampoo

Evaluation of Shampoo

The formulated shampoo was subjected to various quality control tests in order to evaluate its quality. The results of the study are presented in Table 2.

Physical appearance/ visual inspection

The formulation prepared was evaluated for colour, clarity, foam producing ability and fluidity [11]

Determination of pH

A 10% v/v shampoo solution was constituted in distilled water and the pH of the solution was measured by using a calibrated pH meter [12].

Skin irritation test

A 1% v/v shampoo solution was constituted in distilled water and applied over the skin. The application was allowed to remain in contact for 2 h.

Determination of % of solid contents

Percentage of solid contents in the shampoo was measured by taking 4 g of shampoo in a pre-weighed porcelain dish. The liquid portions were completely evaporated and the solids left after evaporation was weighed. The results were expressed as percentage weight of solid contents in the shampoo [13].

Dirt dispersion test

The test was performed as suggested by Deeksha et al., 2014. Briefly, 2 drops of shampoo were mixed with 10 ml of distilled water in a test tube. To this solution, one drop of ponceu 4R (water soluble dye) was added and the contents in the test tube were

shaken for ten times. The amount of ink in the foam was indicated by the employing the rubric such as None, Light, Moderate and Heavy respectively [14].

Foaming ability and foam stability

Foaming ability was determined by shaking 20 ml of 1% formulated shampoo solution for 10 times in a test tube. The total volume of the foam content after 1 min of shaking was recorded. Foam stability was evaluated by recording the foam volume after 1 minute and 4 minute of shake test [15].

Wetting time test

Wetting time was measured by Draves test [16, 17]. A filter paper was cut into 1 inch diameter discs having an average weight of 0.58g. The smooth surface of disc was placed on the surface of 1% v/v shampoo solution and the stopwatch started. The time required for the disc to begin sinking was recorded as the wetting time.

Conditioning performance

A hair tress of an Asian woman collected from a local saloon was cut into four swatches of the tresses with approximately 10 cm length. One of the swatches without washing served as the control. Other three tresses were washed with the shampoos in an identical manner. For each cycle, each tress was shaken with the shampoos in an identical manner. For each cycle, each tress was shaken with the mixture of 10 g of a sample and 10 g of water in a conical flask for 2 minutes and then rinsed with water. Afterward, each tress was left for air drying at room temperature. The tresses were washed for maximum 5 cycles. The conditioning performance of the shampoos such as smoothness and softness of the tresses, was evaluated by 10 volunteers through a blind touch test. The volunteers were blind folded and asked to touch the tresses labeled with random codes. One of the tresses was the control and other three tresses were treated with the sample. For rating, they were asked to rank the conditioning performance of the tresses after touching and using the score from 1 to 4, where 1 is poor, 2 is satisfactory, 3 is good and 4 is excellent [15, 18].

RESULTS AND DISCUSSION:

The formulated herbal shampoo contained all plant materials that provided necessary requirements for an ideal shampoo. A good shampoo is believed to have sufficient viscosity to facilitate easy removal from the container but must not drip down from the hair during use. In this formulation *A. vera* gel imparted necessary viscosity to the preparation in addition to its other conditioning effects. The formula for the shampoo is shown in Table 1.

Table 1: Composition of formulated Herbal Shampoo

Ingredients	Parts used	Extract	Quantity taken
<i>Sapindusmukorossi</i>	pericarp	hydroalcoholic	15 g
<i>Acacia concinna</i>	Pods	hydroalcoholic	6 g
<i>Phyllanthusemblica</i>	fruits	aqueous	16 g
<i>Trigonellafenum-graecum</i>	seeds	aqueous	6 g
<i>Aloe vera</i>	juice	-	5 g
<i>Hibiscus rosa-sinensis</i>	leaves	aqueous	3 g
<i>Azadirachtaindica</i>	leaves	hydroalcoholic	1 g
Caramel	-	-	q.s
Water	-	-	8 ml

Table 2: Evaluation of herbal shampoo

Parameters	Observations
Clarity	Opaque
Colour	Black
Odour	Pleasant
Foam producing ability	Good
pH	5.7
Skin irritation test	No irritancy seen
Determination of solid contents	14.90 % w/w
Dirt dispersion test	Fast removal of dirt
Foaming ability and foam stability	Good
Wetting time	3 seconds
Conditioning performance	Excellent

The formulated herbal shampoo was evaluated for colour, clarity, pH, and skin irritation, percentage of solid contents, dirt dispersion, foaming ability and foam stability, wetting time and conditioning performance using recommended procedures. The results of the study are presented in Table 2.

Physical appearance/visual inspection

The formulated shampoo had a good appealing physical appearance. It was opaque and black in colour (due to caramel) with a slightly pleasant odour. No specific flavoring agent was used in the formulation.

Determination of pH

The pH of shampoo between 5 and 7 helps in minimizing damage to the hair and scalp. The final pH of the 10% formulated shampoo was found to be 5.7 which confirmed to the requirements for an ideal shampoo.

Skin irritation test

A 1% v/v solution of the formulated shampoo in water was applied to the skin and kept in contact for 2 h. Within this period, there were no symptoms of irritation, redness, itchy or inflammation to applied area, explaining that the herbal shampoo was safe to be used.

Determination of % of solid contents

A shampoo is considered good if the percentages of solid contents are sufficient enough so that it can be easily applied and rinsed out from the hair. Lack of enough solids results in to quick wash away of the shampoo from the hair. On the other hand, presence of too much solids are also not encouraged because the shampoo will be hard to work into the hair or too hard to wash out. The percentage of solids in the formulated shampoo was found to be 14.9%.

Dirt dispersion test

Dirt dispersion test is employed to evaluate the cleansing action of a shampoo. Shampoos that cause the water soluble dye to remain concentrated in the foam are considered of poor quality because dye or dirt that stays in the foam is difficult to rinse away and gets re-deposited on the hair [15]. Therefore, the dirt should stay in the aqueous liquid layer for achieving better cleansing action. The formulated shampoo showed fast removal of the water soluble dye (ponceu 4R) with in 3 min and demonstrated good cleansing effect (Fig. 2)

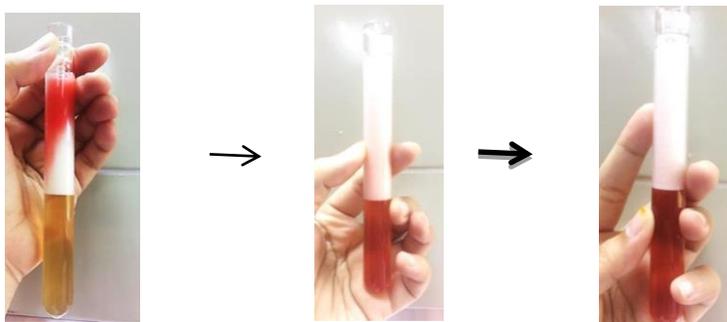


Fig 2: Fast removal of Ponceau 4R soluble dyes within 3 minutes.

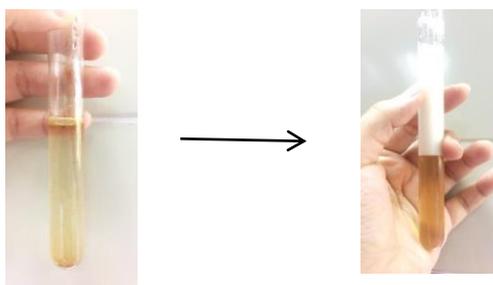


Fig 3: Foam was formed and it was stable.

Foaming ability and foam stability

Ideally, a good shampoo produces sufficient foam when shaken with water and therefore is an important parameter in the evaluation process. The formulated shampoo produced enough foam (more than the height of the liquid layer) when shaken with sufficient water in a test tube (Fig. 3). The foam was left as such for 30 min. There was sufficient foam on the liquid layer covering more than half of the test tube when examined.

Wetting time test

The wetting ability of a surfactant depends on its concentration in the formulation and the test is commonly performed to test the efficacy of the surfactant. The wetting time test was performed by measuring the time taken for the disc to sink in the shampoo solution. Wetting efficiency is considered to be higher if the disc takes less time for sinking. The formulated shampoo showed good wetting time of only 3 sec.

Conditioning performance

Conditioning performance of the formulated shampoo was based on the mean scores of the volunteers. Majority of the volunteers rated score 4 (excellent) for the tress that was washed 3 times by the shampoo. The results of the study clearly indicated that the formulated shampoo has good conditioning performance level.

CONCLUSION:

In this study we formulated a herbal shampoo containing only traditionally used plant materials. The formulation was also evaluated for the physicochemical properties using recommended procedures. The shampoo revealed ideal characteristics of a shampoo. The shampoo was devoid of any harmful chemicals and can be used as an alternative to its synthetic counterpart.

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